Kommunikationstechnik aus Norddeutschland

ALBRECHT SPORTY FAMILY
LPD Transceiver
D- and CEPT- Versions
Technical Construction File

General:

The Albrecht LPD transceivers of the SPORTY-Family series are produced according to I-ETS 300 220 Annex A, CEPT Recommendation T/R 01-4, as 2 way simplex speech transceiver with 10 mW output power (RF as well as radiated) in the 433 MHz ISM frequency band.
The unit is controlled by masked CPU and can cover 433.075 MHz to 434.775 MHz in steps of 25 kHz (69 channels) (Sporty + Profi). In the extended function menue (optional) it is possible to use also Auto Power OFF, Battery Voltage Display and Memory Store and Recall functions. The basic functions are:
Channel Up/Down, Monitor / Squelch, Key Lock, Baby Monitor, Alarm Mode and "Silver" mode for handicapped, blind people or children.
The modulation corresponds to 18K0F3E with a maximum peak deviation of about 5.5 kHz optimized for broadband equipment in ISM ranges according to I-ETS 300 220.

Connectors:

The two versions -D and -CEPT are identical except the antenna connection: According to national German regulations BAPT 222 ZV 125 the rubber antennas of the German D-Versions can be disconnected, and other 0 dB antennas are allowed to be connected via the unit's SMA antenna sockets.
In the CEPT-Versions (all other EU countries), the rubber antennas are fixed.
All models have a 2.5 mm socket with 3-5 mV sensitivity for external electret Microphone with PTT switch in series, and a 3.5 mm socket for earphone or small speakers with more than 8-16 Ohms impedance. The audio output power is about 90 mW.
For EMC reasons, the allowable cable length for audio accessories will be less than 3 m. The MIC input is tested up to 1.5 Volts RMS input at 1250 Hz, all kind of suitable microphone accessory items may be connected legally.
SPORTY FAMILY can also be used for data transmission systems which work via MIC / PHONE sockets. Albrecht recommends to use PC-COM packet radio plug-in modems for data transmission with 1200 bps.

Power supply:

3 Batteries Mignon / AA size provide power for approximately up to 30 hrs receive/standby time or 10 hrs transmit time.
Both type of Alkali-Batteries 3 x 1.5 Volt or NiCd- rechargeable batteries 3 x 1.2 Volts can be used.
The lowest acceptable voltage is 3.24 Volts.
2 battery contacts on the bottom of the units can be used for charging via a stand charger.

CPU and main board

The CPU board contains power stabilizing and switching circuits Q 202, Q 203, Q 215, IC 202 and IC 206, the modulation amplifier and FM low pass filter IC 203 A and B, the audio receiving amplifier IC 207 and Q 1, Q 2, Q 211 and Q 212, the CPU IC 201 the LCD , EEPROM IC 202 for memory back-up, peripheral circuits and the plug-in socket for an optional CTCSS encoder/decoder. With resistors R 202 deleted and R 223 added the "Basic Mode" can be programmed, for "Extended Mode" preset R 202 must be added and R 223 deleted.
The CPU controlls all circuits for frequency generation (PLL), channel selection, Squelch control and squelch level setting, LCD lamp and keyboard lock, PTT circuit (TX and RX enabble /Lock circuits), and Vox switching for Baby and Alarm mode.
The CPU board also contains the sockets for microphone and earphone together with the TX deviation control potentiometer RV 201. A special CPU Input (Baby IN, PIN 55) provides automatic speech controlled TX switching for alarm and baby monitoring

RF Board

The plug-in RF board contains all RF circuits for receive and transmit, the frequency PLL and VCO system and the IF integrated amplifier IC 301 (KA 3361B):

Local Oscillator and TX path

The Voltage Controlled Oscillator Q 501/502 generates the local oscillator frequency by D 503 will be frequency-modulated by the output of the microphone amplifier (on CPU board). The Oscillator frequency is determined by D 501/502, while D 504 works as TX/RX frequency range switch. At the VCO output of Q 502, a diode switch D 308 distributes the local oscillator signals to TX preamplifier Q 318 and to the receiving mixer Q 303.
Buffer Q 315, driver Q 314 and final amplifier Q 311, 312, 313 then produce the desired output power.The TX signal is passed through the matching filter L 314, the switching diode D 304, the harmonics filters L 311and L 309 with the appropriate filter capacitors to the antenna port ANT 301 (SMA). The German version (D-Version) can use this SMA socket directly for any 0 dB plug-in antenna, while the CEPT version will have a fixed antenna which is not detachable.

RX path

The antenna signal will pass through the common parts of antenna and harmonics filter, then through fixed tuned band pass pre-filters with L 312, L 316, L 301, is pre-amplified in Q 301. Matching filters L 325/L302 with tuned TC 3 lead the signal to the second pre-amplifier Q 302. A filter chain will follow before the signal enters the first mixer Q 303. Mixed with the local frequency (433 MHz- 21.4 MHz) the first IF frequency 21.4 MHz will be entered to crystal filter F 301. A buffer amp Q 304 provides the filter matching and input matching to the integrated second mixer and IF circuit IC 301.
A 450 kHz ceramic filter, which provides the final IF selectivity, belongs to the peripheral parts of the IF circuit. The second local oscillator frequency is derived from the clock oscillator X 301 of the PLL circuit by doubling this 10.475 MHz frequency.

PLL circuit:

A portion of the local oscillator signal is passed via C 353 to PLL integrated circuit IC 302.input pin 6 The circuit contains programmable frequency dividers, comparators and phase -lock loop. X 301 provides the high stable clock frequency 10.475 MHz. The data transmission to and from the CPU is established by serial data transmission via PIN's 2, 3 and 4 (CL, DA and DE signals). The DC pulses from the phase comparator pass the DC amplifier Q 323/324 and the loop filter R 348, R 349, R 386, C 354, C 356,and form then the DC voltage for the VCO diodes.

Demodulator output

The output signal of IC 301 at Pin 9 is the RX audio, which still contains higher audio frequencies as white noise, which will be used for squech detecting and switching.
The noise is selected by external LC-Filter L 306 / C 305, amplified on-chip and rectified by D 302. The squelch-switching point is adjustable by Chip Trimmer RV 301. The squelch adjustment is factory-prealigned so that the squelch just opens at SL 7 software setting. This level is passed to CPU. The audio is passed to the main board connector . From there, the audio can reach the CTCSS decoder input and frequencies above 300 Hz pass a high pass filter Q 212. Audio preamp is Q 211, Q1 and Q 2 are switching circuits for switching between volume potentiometer (normal mode) and a fixed preset mode for handicapped people or children ("silver" mode).

RX audio amplifier:

The signal comes from volume potentiometer RV 202 and enters the integrated audio amplifier IC 207 Q 213/214 provide the MUTE switching of the audio preamplifier via CPU. The amplified signal will reach the speaker socket J 202 with internal switch and from there the internal speaker SPK1.

Functions:

SPORTY- Family is equipped with only a minimum of simple, self-explaining user functions while it is still possible (as option) to program some extended functions like battery voltage display and up to 10 memory operation. There are push buttons for basic functions:

- Transmit (PTT),
- Lamp,
- Function,
- Channel Up/Down,
- Monitor/Squelch,
- Unlock/Power/CTCSS

A CTCSS decoder/encoder module can be easily plugged in from outside without opening the unit. A rubber cover on the bottom side can be removed, the CTCSS module will be plugged in and the rubber cover will close the hole again.
The decoder/encoder tones can be programmed by software steps to all US-Standard CTCSS tones between 67 Hz and 250 Hz. CTCSS tones will be transmitted with a reduced FM deviation around 800 Hz directly by bypassing the MOD amplifier to the VCO. The CTCSS module can be programmed to TX, RX or TX and RX mode..

There is no memory back-up battery. The last used setting (channel, squelch and CTCSS information) is stored automatically in all versions by EEPROM after switching off with the on/off button

In case of computer failure, a general reset can be made by POWER ON while FUNCTION key is pressed.

Note concerning EMC requirements and approvals:

ETS 300 683 is fullfilled with cable lenghts of any accessory item not longer than 3 m. The EC type approval document concerning the EMC directive 89/336/EEC has been issued by the notified body 0499 SEE Luxemburg .
Both versions are in all electrical and mechanical parts identically. Different is only the antenna fixing in the CEPT version, so the antenna is not detachable in this version..